December 1967

Brief 67-10608

NASA TECH BRIEF

A Ceramic Composite Thermal Insulation

The problem:

An insulating material is required for protection of structures and components related to a space vehicle during launch. The thermal forces imposed on such material at this time derive from radiation of engine plume energy and convection of energy within recirculating exhaust gases. Because 60 to 80% of the total thermal load is radiative, an insulating material with high reflectivity in the infrared region is desirable. Although such an insulation has previously been perfected, insofar as its thermally reflective properties are concerned, its mechanical property of adhesion to substrate material during cure and exposure to high temperature has been poor due to migration away from the insulation/substrate interface of the colloidal silica binder.

The solution:

A ceramic composite thermal insulation comprised of alumina–silica fibers, pigmentary potassium titanate, and asbestos fibers, bonded with a colloidal silica sol. In this compound, the use of pigmentary rather than fibrous potassium titanate has resulted in insulating capabilities to radiant heat beyond the maximum limits of the previous insulation. As to convective heat, this insulation is comparable to the previous insulation at lower levels (10 and 30 Btu/ft^2-sec) but considerably superior at higher levels (50 and 90 Btu/ft^2-sec).

Solution of the binder migration problem is accomplished by gelation of the colloidal silica sol. This gelation is achieved by acidifying the sol to a pH of 6.6 over a gel time of 5-1/2 hours.

Note:

Further information concerning this invention is presented in NASA TM X-53646, "Thermal Insulations for Launch Vehicle Radiant Heating Environments," by Vaughn F. Seitzinger, August 1967, available from:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10608

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: MFS-13991

Category 03